Title

A new title is submitted herewith based on the suggestion made by the examiner.

Rejection under 35 U.S.C. 112

Claim 16 stands rejected as being indefinite because of the phrase "fillers and additives".

Claim 16 has been amended to eliminate "fillers" since they are considered to be encompassed by the term "additives".

Rejection under 35 U.S.C. 103

Claims 1-16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Okumura et al. (US 5,693,236).*

The Examiner argues that the cited prior art teaches injection molded plastic objects having a composite layer made by etching to deposit fluorocarbon polymers thereon. The resulting objects are water repellent as disclosed in the abstract. The Examiner further argues that it would have been obvious to make objects having the surface characteristics as disclosed in the prior art by employing suitable etching techniques and materials to make the disclosed objects useful for any desired purpose.

As also set forth by the examiner, the motivation to employ the technology of the prior art would be found in the abstract where the water repellency of the treated object is taught. The examiner further states that it is deemed desirable to make objects water repellent in order to protect the underlying surface from potentially deleterious effects of water/water soluble agents.

The examiner points out that the phrase "plasma etching by micro sandblasting effect" is a process limitation and is given no patentable weight because of the similarity of the surface produced by the prior art in comparison to applicant's surface.

The examiner also states that the selection of fluoropolymers and/or plastic surfaces to be employed in making the objects of the prior art is an engineering choice depending on the properties desired in the final product. The shape/form of the objects made by the prior art technology is deemed a matter of design/engineering choice depending on the properties needed for a particular application.

The goal of the present invention is to provide a permanent adhesive connection

between, in particular, parts made from fluoropolymers such as PTFE, and components made of other materials such as plastic materials or elastomers. Providing water repellency is of no concern in this connection. There is no motivation whatsoever in the prior art disclosure of enhanced water repellency that could lead a person skilled in the art to employ the prior art method for improving the bonding properties of a fluorocarbon part. The present invention is also not concerned with protecting underlying surfaces from deleterious effects of water, but with providing a permanent adhesive connection between parts, wherein one part is comprised of fluorocarbon polymer.

The cited prior art is directed to obtaining a water-repellent surface which is set forth in the abstract of this prior art reference.

According to the present invention, a permanent adhesive connection between PTFE parts and a support member made, for example, of rubber in the case of the sealing ring or gasket is desired. The gasket requires that the PTFE part and the rubber are connected fixedly with one another such that both parts will not separate from one another.

The cited prior art reference, on the other hand, is directed, according to col. 1, lines 6-28, to provide a water-repellent surfaces on ships, toilet bowls etc. The water-repellant surface prevents water from wetting the surface, and a thin film of air is produced between the water-repellant surface, for example, the ship bottom, and the water to thus improve the ship's speed. Already the indication of such a different field of application shows that there are no similarities between the present invention and the cited prior art reference.

In the present invention, the parts to be treated, for example, PTFE disks or plates are activated by plasma treatment. As already discussed in prior submissions to the U.S. PTO, this plasma treatment has the effect of micro sandblasting (plasma etching) and/or providing chemical changes in the micro range on the surface. The plasma activation of the parts allows connecting the parts to one another without further treatment with other materials and eliminates wet etching which requires the use of harmful substances. Thus, the physical and chemical changes on the surface caused by plasma activation enable the fixed connection between the support member and the part(s) to be permanently connected thereto. This is clearly set forth in the specification. The present invention is not directed to improve water-repellency; it is directed to improve bonding between parts of a

component wherein at least one surface to be bonded is comprised of poly fluorocarbon and at least this one surface (comprised of fluorocarbon polymer) is treated by plasma activation (see claim 1).

The prior art reference discusses a particular type of water-repellant surfaces in col. 2, lines 1 through 30, and it is this type of water-repellant surfaces that the prior art method deals with. As set forth in col. 2, it is known that a smooth surface coated with a water-repellant material has a certain water contact angle and that this water contact angle can be improved when the surface is no longer smooth but provided with small pits and projections. Measures to produce such a pitted surface are described in col. 2, lines 12-22. It is then discussed that the known methods of forming pits and projections have certain drawbacks in that there are limits to the smallness of the pits and projections and thus to the desired improvement of the water contact angle beyond 150 degrees.

The object of the prior art method is stated in col. 2, lines 33-37, as follows: "to provide a **water-repellant surface structure** that exhibits **excellent water repellency by extremely small pits and projections** being efficiently formed on a surface of an object" (emphasis added).

Thus, the pitted surface structure in itself is a measure for improving the water repellency, and the pitted structure has nothing to do with enabling or improving the deposition of or coating with fluorocarbon polymers. Etching is not carried out for the purpose of improving bonding between the substrate and the fluorocarbon polymers but is carried out to increase pitting and improve the water repellency by providing smaller pits and projections.

In the cited prior art reference, the objects to be treated are coated with needle-like materials by different methods. In this connection, the needles are mixed with a vulcanizable or curable liquid. In cols. 2 and 3 of this prior art reference the following possibilities are mentioned.

(A) application of a mixture onto the surface of the article (col. 2, lines 44ff);

(B) according to col. 2, lines 62ff, the mixture can be applied by spraying or pressing;

(C) in col. 3, lines 11ff, the mixture is applied by casting/pressing and sintering;

(D) for manufacturing the water-repellent surface, an adhesive can be applied to the surface of the article on which the needle-like material is dispersed and immobilized by the adhesive;

(E) in col. 3, lines 36ff, a method is described where the needle-like material is dispersed onto the surface of the article, an adhesive is applied, and the needles that are now immobilized are coated with a water-repellent substance;

(F) according to col. 3, lines 47ff, it is also possible to disperse the needle-like material onto the surface of the article, to apply a thin film in order to immobilize the needles, and to coat the needles with a water-repellent substance;

(G) in col. 3, lines 56ff, a further possibility is discussed where the surface of the needle-like material is coated with a water-repellent substance, an adhesive is applied to the surface of the article, and, subsequently, the needle-like material with the water-repellent substance is dispersed on the surface.

According to col. 4, lines 66, to col. 5, line 1, the coating produced as described above and comprised of the solidified needle-like material7adhesive is subjected to an etching process which is carried out as a wet chemical or a plasma etching process. The etching rate of the base material, as disclosed in the abstract, is significantly higher than the etching rate of the needle-like material. The resulting surface with the needle-like structure forming the pits and the projections is then provided with a water-repellent coating of a fluorocarbon material.

It is not apparent to the applicant where there should be any similarities to the present invention.

The present invention differs in its basic principles from the prior art in that the **fluorocarbon containing material or surface** is subjected to the etching process in order to provide a plasma-etched or micro sand-blasted surface. According to the present invention, the plasma activation causes roughening of the surface while chemical modifications take place; this is referred to in the invention as micro sandblasting effect.

In the method according to the cited prior art, the microstructure is generated by

embedding crystals in a matrix or, as an alternative, a needle-like structure is generated in that the matrix is partially removed in a subsequent etching process (wet-chemically or by plasma etching) so that at least the needle tips are again exposed. The etched material is not the fluorocarbon polymer; the fluorocarbon polymer is applied to the etched surface.

The prior art does not disclose plasma etching for creating a sandblasting effect and chemical changes within the fluorocarbon polymer surface. In the present invention, by means of the sandblasting effect the surface area is enlarged so that more surface area is available for the adhesion partner. In the cited prior art, on the other hand, a needle-like surface is generated which in itself improves water-repellency in comparison to a smooth surface coated with a water repellant. Actually, the structure produced by the prior art method prevents other substances (water) from being bonded more strongly; instead, the opposite is true: the pitted structure is provided to prevent bonding (i.e., prevent attachment and wetting). The surface created by the cited prior art method with its needle-like projections has exactly the opposite purpose, i.e., to prevent a solid or fixed connection in order to avoid wetting. The needle-like surface results in extremely excellent water repellency action. This also shows the significant difference between the present invention and the cited prior art.

The prior art substrate, as long as it has not been treated, can be wetted with water. By generating the needle-like surface structure in connection with the application of the water-repellent coating comprised of fluorocarbon polymers (col. 5, lines 2-10), for example by plasma polymerization, a water-repellent surface is generated.

It is also apparent that the needle-like surface structure does not improve, and is not intended to improve, bonding between the surface and the water-repellant coating containing fluorine since the methods described in col. 5, lines 3-10, are complex and require drastic conditions: vapor deposition; baking; chemical bonding by siloxane reactants.

In the present invention, the opposite is achieved of what is provided by the cited prior art reference. By changing the surface properties, the initially water-repellant surface of the fluorocarbon polymer part is changed to a wettable state by plasma activation. In the method according to the cited prior art, the surface property is changed from wettable

to water-repellant while the pitted structure according to the prior art **enhances** water repellency. For this reason, the cited prior art reference clearly cannot suggest the features of the present invention.

As is well known in the art, the surfaces of the fluorocarbon polymers, in particular, of PTFE, have very low surface energies and are therefore not or hardly (water) wettable. According to the present invention, as a result of the plasma activation process (sandblasting effect and chemical change) the treated fluorocarbon polymer surface becomes wettable which can be easily demonstrated by applying water to the surface. The micro sandblasting effect results particularly in a surface enlargement in the micro range (micro crater structure) but not in a needle-like structure. The obtained surface modification and wettability according to the invention is extremely important in connection with adhesion and bonding of the treated particles parts, but obviously differs from the pitted structure obtained by the prior art method since improved water repellency counteracts improved bonding.

According to the present invention, the material to be treated is comprised exclusively of or primarily of carbon and fluorine and is therefore anti-adhesive and water-repellent. After plasma treatment, in which a reduction or substitution of fluorine takes place, the materials have a wettable, enlarged surface area caused by the micro sandblasting effect increasing the adhesive properties so that the surface is capable of bonding to other parts simply by pressure application and/or heat treatment.

In the cited prior art reference, the surface is not to be made wettable but is to be made more water-repellent in a two-step process. After generating the needle-like basic structure, in a second step the surface is provided with a water-repellent coating. For this purpose different methods are suggested, for example, plasma polymerization (plasma coating) with a gas containing carbon and fluorine (for example, CHF_3) or a coating with fluorine polymer or fluorine-containing substances, as disclosed in col. 2, lines 2-10. It is apparent that this has nothing in common with the subject matter of the present invention.

A further difference resides in that according to the present invention, a single-step is employed to change the surface in that the micro sandblasting effect and chemical modification are produced in parallel.

In contrast to this, the prior art employs several steps: the needle-like basic structure is produced first and, by means of etching, at least the needle tips are exposed. Subsequently, the water-repellent fluorine-containing coating is applied.

In the present invention, the surface structure is enlarged during plasma activation and therefore the contact surface and the adhesive surface is enlarged.

The cited prior art reference cannot provide any suggestion or incentive that would lead a person skilled in the art to the present invention. This cited prior art reference differs with respect to its goal as well as the means for obtaining this goal completely from the present invention.

CONCLUSION

In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

Should the Examiner have any further objections or suggestions, the undersigned would appreciate a phone call or e-mail communication from the examiner to discuss appropriate amendments to place the application into condition for allowance.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on May 5, 2003,

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GEH
Encl.: - amended claim 16 (clean copy and marked-up version - 2 sheets);
- new title (1 sheet);
- time extension petition (1 sheet)

MARKED-UP CLAIM VERSION TO SHOW CHANGES MADE

16. (Amended) A component according to claim 1, wherein said at least one part (6, 28) contains ~~fillers and~~ additives.

NEW TITLE

Components having Enhanced Adhesion between Parts